

University of Bahrain
College of Information Technology
Department of Computer Engineering

ITCE 341 : Introduction to microprocessors

Term Test 2

Time: 1:00 hour

Date: Tuesday, 16 May 2006

Instructor: Dr. Raida Al-Alawi

| Question | Marks | Score |
|----------|-------|-------|
| 1 | 20 | |
| 2 | 25 | |
| 3 | 25 | |
| 4 | 30 | |
| Total | 100 | |

| | |
|-----------|-------|
| ID. No. : | Name: |
|-----------|-------|

Make sure that the test has 4 pages and 4 different questions.
SHOW ALL YOUR WORK

Q1) **(20 pts)**

Write a program that will swap the high nibble of AL with the low nibble of BL.

Example: If AL= 4A and BL = F7

Then after executing the program:

AL = 7A and BL = F4 *(note: This is just an example)*

```
ORG 0100H
mov cl, al
mov dl, bl
shr al, 4
and BL, 0F0h
or bl, al
shl dl, 4
and cl, 0fh
or cl, dl
mov al, cl
ret
```



Q2)

(25 pts)

Two 100-bytes strings are stored in memory starting from address STRNG1 and STRNG2. Using **String Instructions**, write a program that will count the number of corresponding characters that are different in the two strings.

; Q2 Test 2 05-06, Sem 2

```
ORG 0100H
MOV AX, CS
MOV DS, AX
MOV ES, AX
LEA SI, STRN1
LEA DI, STRN2
MOV CX, 100
XOR BX, BX ; CLEAR COUNTER
CLD
AGAIN: CMPSB
       JE NEXT
       INC BX
NEXT:  LOOP AGAIN
       RET
```



Q3)

(25 pts)

Write an assembly language program that will compute the sum:

$$\text{SUM} = 1^2 + 2^2 + 3^2 + 4^2 + \dots + N^2$$

Where N is a number stored in a single memory location referenced N. Store the result in memory location referenced SUM.

```
org 0100h
xor bx, bx    ;clear SUML
mov dx, bx    ;clear SUMH
mov CL, N     ;get N
mov CH, 0
again:
mov al, cl
mul cl        ; find NxN
add bx, ax    ;accumulate SUML
adc dx, 0     ;SUMH
loop again
mov sum, bx
mov sum+2, dx
ret
N      db      10
sum     db      ?
```



Q4)

(30 pts)

Write a program that will ask the user to enter a message followed by a CR (0DH), then print the number of times (in decimal) that the character 'a' or 'A' occurs in the input string.

Enter a message followed by CR:

Number of times that a or A occurs =

;Q4 Test 2, 05-06 Sem. 2

prntmsg MACRO msg

lea dx, msg

mov ah, 09h

int 21h

endm

getmsg MACRO in_msg

lea dx, in_msg

mov ah, 0ah

int 21h

endm

prntchar MACRO char

mov dl, char

mov ah, 02

int 21h

endm

org 0100h

push cs

pop ds

prntmsg msg1

prntchar 0ah

prntchar 0dh

getmsg inmsg

prntchar 0ah

prntchar 0dh

xor ch, ch

mov cl, [inmsg+1]

lea bx, inmsg+2

XOR AL, AL ;A's counter

again: cmp [bx], 'a'

je L1

cmp [bx], 'A'

jne L2

L1: inc AL

L2: inc bx

loop again

aam ;convert to unpacked BCD

or ax, 3030H ;convert to ASCII

mov bx, ax ;save ax

prntmsg msg2

prntchar bh

prntchar bl

ret

inmsg db 80, ?, 80 DUP(?)

msg1 db 'Enter a message followed by a CR \$'

msg2 db 'Number of times that a or A occurs = \$'

INT 21h / AH=1 - read character from standard input, with echo, result is stored in **AL**.

if there is no character in the keyboard buffer, the function waits until any key is pressed.

INT 21h / AH=2 - write character to standard output.

DL = character to write, after execution **AL = DL**.

INT 21h / AH=9 - output of a string at **DS:DX**. String must be terminated by '\$'.

INT 21h / AH=0Ah - input of a string to **DS:DX**, first byte is buffer size, second byte is number of chars actually read.